



Metacognitive learning strategies and academic performance: A correlational study among Moroccan nursing students

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Abstract

Introduction: Metacognitive strategies, including planning, control, and regulation, are crucial in enhancing learning outcomes and academic success. This cross-sectional study aimed to examine the utilization of metacognitive learning strategies among nursing students and their association with academic performance.

Methods: The study was conducted at a nursing institute and included participants from various semesters in the nursing program. A questionnaire was used to assess the use of metacognitive strategies and students' academic performance. Data were analyzed using descriptive statistics, t-tests, and correlation analysis.

Results: The results showed that a higher percentage of students reported "good use" of metacognitive strategies. Females tended to use these strategies more frequently than males. Additionally, students in higher semesters demonstrated better utilization of the strategies compared to those in lower semesters. There was a significant positive correlation between academic performance and the utilization of the regulation strategy.

Discussion: The findings highlight the importance of fostering metacognitive learning strategies to enhance academic achievement in nursing education. Educators and institutions can use these findings to improve students' learning experiences and academic outcomes. Further research is needed to explore the long-term effects of metacognitive training in nursing education.

Take-home message: Metacognitive learning strategies, especially regulation, significantly impact nursing students' academic success. Integrating these strategies into curricula can enhance learning outcomes and benefit educators and students alike in nursing education.

Keywords: academic performance; metacognitive learning strategies; nursing students; planning, control, and regulation.

INTRODUCTION

The emergence of cognitive and socio-constructivist theories has revolutionized our understanding of the teaching-learning process. According to these theories, learning involves constructing knowledge by integrating new information with existing cognitive structures. Learners are encouraged to actively engage in the learning process, actively assimilating and accommodating new knowledge within their existing understanding [1,2].

Cognitive psychology has significantly contributed to our comprehension of learning strategies, mechanisms of knowledge production, factors influencing knowledge reuse, and the meaningfulness that learning brings learners when encountering new information [3-5].

The role of the learner in the teaching and learning process is now undeniable [6]. As a result, questions about the teacher's role and the content are addressed concurrently with inquiries about the learner's own understanding [6]. According to researchers like Weinstein CE and Mayer RE, (1983), if one wants to improve the effectiveness of instruction, they shouldn't just focus on the learner's prior knowledge and pay close attention to the strategies and activities they use to do so. So, it is crucial to teach and help students develop the learning strategies that are appropriate for a certain learning scenario [7].

According to Saint Piere [8] and Boulet et al. [9], there are four different types of learning strategies: cognitive, affective, resource management, and metacognitive strategies. Among these, metacognitive strategies pertain to the learner's awareness and comprehension of their own mental processes and utilizing that awareness for learning. Planification, control, and regulation are included in the classification of metacognitive strategies. According to Brown, it involves a group of strategic decisions and behaviors engaged during a cognitive activity. It involves planning, anticipating, controlling and regulating activities during and after task completion [10].

Duchesneau et al. highlighted the importance of developing metacognitive skills in health sciences, specifically planning, regulating, and evaluating. They emphasize that these metacognitive abilities are cultivated through practical experience in the field of health sciences [11]. Consequently, it becomes essential for nursing and health sciences students to foster and nurture metacognitive skills throughout their educational journey. In other related studies, researchers have also observed similar trends and challenges among students in healthcare sciences, where many students exhibit a limited utilization of comprehensive learning strategies, indicating the need for further attention and support in developing effective learning approaches. Yet, according to a recent study on the metacognitive profile of nursing students and their academic success in Brazil in 2021, the authors found a correlation between the planning strategy and the final grade received by nursing students. They claim that planning is the only strategy capable of achieving a high academic performance [12]. Furthermore, a study on the relationship between learning strategies and academic success among nursing students at the University of Puerto Rico found this relationship to be favorable and statistically significant [13].

Despite the availability of diverse learning strategies, students' utilization of metacognitive learning strategies remains generally unsatisfactory. In Morocco, Tahiri's research established a correlation between learning challenges and a lack of planning, a vital component of learning strategies [14]. Maamri's study on factors hindering students from attaining required knowledge for nursing care revealed that many nursing students struggled with memorization and learning difficulties due to inappropriate study habits [15].

Considering the evidence presented above, the primary objective of this study is to explore the utilization of metacognitive learning strategies among nursing students and examine the relationship between their usage of these strategies and their academic performance.

METHODS

Study design, participants, and sampling method

A cross-sectional, correlational study was designed to investigate metacognitive learning strategies and their relationship with students' academic performance at the Higher Institute of Nursing Professions and Health Technics in Ouarzazate, southeast Morocco. The study was conducted between February and June 2022. In the present study, we carried out a census sampling based on the selection of all students in training at the institute (exhaustive sampling) with a number of 242 persons. All students who agreed to participate in the study were included.

Data collection

Data collection was achieved through the reuse and adaptation of a known and validated questionnaire "Inventory of student learning strategies at the University". The instrument was a two-part questionnaire including demographic information and statements related to the three metacognitive strategies under study. Participants were asked to indicate the degree of use of the items related to the metacognitive strategies on a Likert scale of 4 points.

Prior to conducting the study, the questionnaire was reviewed by a group of experienced nursing educators. To check the sequence, consistency, understanding, and wording of the questions, the questionnaire was pretested with 18 students in other institutes.

To enhance the visibility and analysis of our data, we combined the response qualifiers "never" and "rarely" to indicate the underuse of metacognitive strategies. In contrast, the qualifiers "often" and "always" were combined to represent good use of these strategies. Next, we calculated the mean for each metacognitive learning strategy based on students' responses on the Likert four-point scale. Regarding academic performance, we computed a score by considering student grades and the semester of validation.

Data analysis

The collected data were analyzed using the software "SPSS.21.0". A p-value of 5% was used. Quantitative variables were expressed as mean \pm standard deviation. Categorical variables were presented as tables of numbers and frequencies. The qualifiers "never" and "rarely" were combined along with the qualifiers "often" and "always" to denote underuse and good use of metacognitive strategies, respectively. The relationship between metacognitive learning strategies and academic outcomes was calculated using a correlation test and a chi-square association test by averaging the score regarding the student's level of performance and another average score of the use of each metacognitive strategy.

Ethical considerations

Ethical rules are respected and announced to the respondents before data collection, namely: (a) obtaining authorization from the institute's administration to facilitate access to information and give legitimacy to the study, (b) explaining to the students who participated in this study the purpose of the survey, (c) respecting the anonymity of the participants, (d) obtaining the consent of the people involved in the study, (e) confidentiality of the information, (f) commitment to the use of the data collected only for research purposes.

RESULTS AND DISCUSSION

Presentation of the population

Of the 242 students who participated in the study, 228 questionnaires were gathered, resulting in a response rate of 94%. The socio-demographic characteristics of the study participants are presented in Table 1.

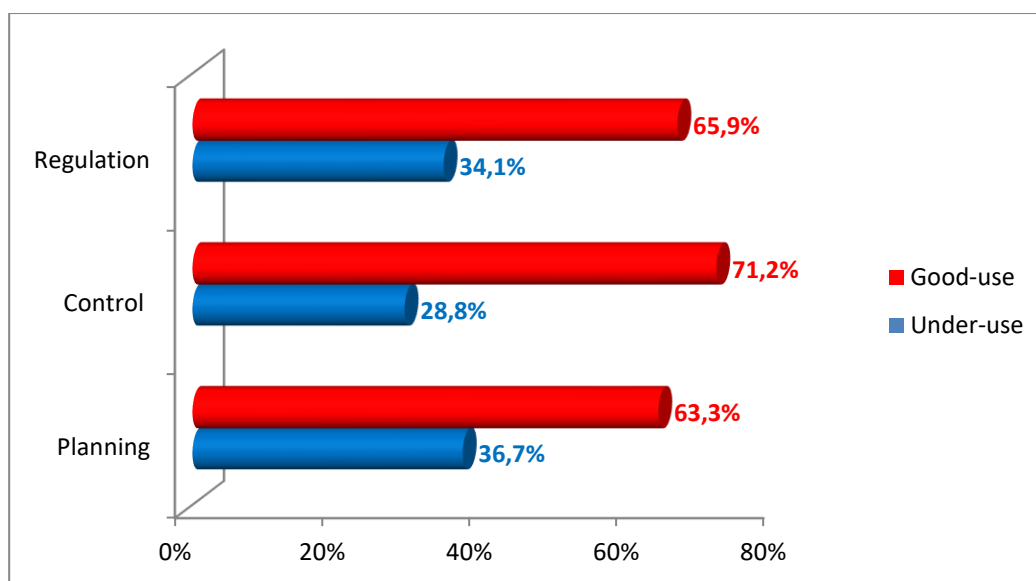
Table 1. Sample characteristics.

	N	Percentage (%)
Sex		
F	171	75
M	57	25
Age in years		
18 years	30	13.2
19 years	76	33.3
20 years	66	28.9
more than 20 years	56	24.6
Level of study		
semester 2	91	39.9
semester 4	91	39.9
semester 6	46	20.2

In this study, 75% of the participants were female and 25% were male. The ages of the participants ranged from 18 to 23 years, with an average of 19.63 years (± 1.72). Regarding the current semester of study, the results show that 39.9% of the students are studying in the second semester, 39.9% in the fourth semester, and 20.2% in the sixth and last semester of the course.

For students' Academic achievement, the results show that 72.4% of the students validated the previous semester in the normal session and 27.6% validated in the catch-up session. Regarding the validation of the previous semester, the percentage of students who validated the last semester with a good grade is 44.7%, followed by students who validated with a quite good grade (37.7%), then the satisfactory grade with 9.2% and lastly the very good grades with 7.5% and 0.4% respectively.

Figure 1. Distribution of metacognitive strategies according to the degree of their use among the students.



The use of metacognitive strategies

Based on the analysis of metacognitive learning strategies in our sample, it is evident that a higher percentage of students reported "good use" of the three metacognitive strategies (those who answered "Always" or "Often") compared to those who reported "under-use" of the strategy (students who answered "Sometimes" or "Never"). Specifically, 71.2% of the students reported a good use of the control strategy, 65.9% reported a good use of the regulation strategy, and 63.3% stated a good use of the planning strategy.

Table 2. Means of metacognitive strategies used according to gender, level of study, and age of students.

	Items related to the metacognitive planning strategy	Items related to the metacognitive strategy of control	Items related to the metacognitive strategy of regulation
Gender			
Male	2.11	1.95	2.04
Female	2.20	2.09	2.08
T	1.74	2.29	0.79
Sig	.083	.023	.550
Level of study			
Semester 2	2.05	1.91	1.95
Semester 4	2.16	2.05	2.08
T	2.39	1.59	2.67
Sig	0.02	0.11	0.032
Age			
Less than 20 years	2.11	1.93	2.01
Over 20 years	2.19	2.14	2.18
T	1.44	3.58	2.56
Sig	0.15	0.001	0.01

Table 2 presents the means of metacognitive strategy use based on gender, level of study, and age of students. The values represent the average scores for three different types of metacognitive strategies: metacognitive planning, metacognitive strategy of control, and metacognitive strategy of regulation.

the data indicates that females have slightly higher mean scores in all three metacognitive strategies compared to males. the differences are statistically significant in terms of metacognitive strategy of control (p value = 0.023, t = 2.29).

When it comes to the level of study, students in Semester 4 have higher mean scores in all three metacognitive strategies compared to those in Semester 2. The differences in metacognitive planning and the metacognitive strategy of regulation are statistically significant (Sig=.032, $t=2.16$).

Regarding the age of students, the data shows that the average scores for the three metacognitive strategies of planning, controlling, and regulating are higher among students older than 20 years with the metacognitive strategies of planning (2,19 0,38), controlling (2,14 0,36), and regulating (2,18 0,43). Two strategies, namely the control strategy (Sig=0,001, $t=3,58$) and the regulation strategy (Sig=0,012, $t=2,56$), show a significant difference in these averages.

The relationship between metacognitive learning strategies and students' academic achievement

The correlation between students' academic success and their utilization of metacognitive learning strategies was examined by averaging their academic performance scores and strategy usage scores. The findings revealed a statistically significant correlation between students' academic performance and their utilization of the regulation strategy ($r=0.173$; $p=0.009$). Additionally, correlations were observed between the three strategies and each other.

Table 3. Correlation between academic achievement level and level of use of metacognitive strategies.

		Level of academic performance	Utilization level of the planning strategy	Utilization level of the control strategy	Utilization rate of the regulation strategy	Level of application of the three strategies
Level of academic performance	Correlation coefficient	1				
	Sig. (Bilatéral)					
Utilization level of the planning strategy	Correlation coefficient	-.019	1			
	Sig. (Bilatéral)	.776				
Utilization level of the control strategy	Correlation coefficient	.038	.472**	1		
	Sig. (Bilatéral)	.566	.000			
Utilization rate of the regulation strategy	Correlation coefficient	.173**	.148*	.359**	1	
	Sig. (Bilatéral)	.009	.025	.000		
Level of application of the three strategies	Correlation coefficient	.096	.613**	.789**	.499**	1
	Sig. (Bilatéral)	.151	.000	.000	.000	

DISCUSSION

The main objective of this study is to investigate the metacognitive learning strategies employed by students explore the association between the use of these strategies and students' academic performance. The study targeted a population of 242 nursing students, of which 228 (94%) responded to our questionnaire: The general characteristics of the respondents are marked by: a) a predominance of the female gender with a rate of 75%, b) the age range of the participants was between 18 and 23 years, c) 39.9% of the students are studying in the first year, 39.9% in the second year, and 20.2% in the third and final year.

Students' use of metacognitive learning strategies

Based on the results of our study, 71.2% of the participants reported using metacognitive control strategy. The metacognitive control strategy involves techniques and processes used by students to monitor and regulate their cognitive processes during learning. It includes activities such as setting goals, planning study sessions, monitoring comprehension, and evaluating progress to ensure effective learning outcomes. These findings are supported by a study by Espindola CKN et al. (2021) on the metacognitive profile of nursing students [12]. According to this study, the majority of students have used the metacognitive control strategy. similarly, a study by Kabwe M.P. et al. (2020), found that 79.8% of nursing students at Lubumbashi's Institute for Advanced Medical Techniques used this control strategy when teaching and managing nursing care [16].

Concerning the planning strategy, our study findings indicated that a significant proportion of students (63.3%) employ this metacognitive approach more frequently. A recent study in Brazil on the metacognitive profile and academic

performance of nursing students shows that the planning strategy is not the most popular among Brazilian nursing students [12]. In the same vein, and according to the findings of Abouhanifa's (2018) study on the use of metacognitive strategies as support for problem-solving in Morocco, participants are not accustomed to identifying the goal of a problem beforehand, they are unable to set goals before beginning to respond, and they fail to choose their goal [17].

Use of learning metacognitive strategies according to the participants' socio-demographic factors

Overall, female differ from the male students by using metacognitive learning strategies more frequently, particularly the control strategy with the identification of a significant gender difference. These findings are consistent with those of Bidejerano (2005) who demonstrated that the average use of metacognitive strategies by female students is significantly higher than that of male students, with $M=4.6$ among female students and $M=4.2$ among male students, in a study conducted with first-year students at a university in the northeast of the United States [18].

According to our results, there is a significant difference in the use of two metacognitive strategies, namely "planning" and "regulation," according to the participants' study level. Our study aligns with previous research conducted by Vanmuylder et al [19], which also examined learning strategies across different study levels. Similar to our findings Vanmuylder et al. indicated a statistically significant increase in the utilization of planning and regulation tools during the transition from the first to the third year of study [19]. Specifically, the average usage scores increased from 1.3 in the first year to 1.7 in the third year. The lack of use of learning strategies in S2 (first year) is likely due to the difficulty that students initially encounter when transitioning from secondary to higher education. These students are unfamiliar with the rules and disregard university work practices, which are undoubtedly different from those used in secondary education. Students may experience a range of emotions, many of which are particularly strong during the first year of study. Success in the first year and the integration of higher education are often seen by students as significant life milestones with ramifications for their future professional lives. It may also be related to the absence of an integration phase and a diagnostic assessment of abilities (among other learning strategies) that should be organized at the beginning of each academic year for the benefit of new students.

Regarding age-related findings, they supported effective use of the three metacognitive strategies among students above the age of 20, with statistically significant differences in terms of the control and regulation strategies. This finding is consistent with that of Clifton et al., who showed that older and more mature students frequently learn how to deal with challenging situations more skillfully, overcome obstacles, and adapt very skillfully to their university environment, both on the academic and social levels [20]. Barkatou also came to the conclusion that the percentages favoring the effective use of strategies appeared to rise in the over-21 age group [21].

The metacognitive learning strategies in relation to academic success

The findings of our study show a positive significant correlation ($r=0.137$ and $signification=.009$) between the performance level of students and the use of the metacognitive regulation strategy, nursing students who use the most items related to the strategy of regulation achieve good academic results. This result is consistent with a study on student performance in pediatric nursing and the use of learning strategies, there is a strong and positive relationship between student performance and the sub-metacognitive regulation strategy with a $r=.673$, $P\leq .001$ [22]. However, this result conflicts with those of Espindola CKN et al. (2021) who examined the metacognitive profile of nursing students in Brazil. These authors found a correlation between the planning strategy and the final grade of academic performance of nursing students ($p=0.05$ and $r=0.2844$). Even though it may not be the skill that students use the most, these researchers believe that the planning strategy is the only one that can predict academic success [12].

Despite the fact that only one metacognitive skill (regulation) was linked to academic performance in our study, other research, such as that by Hayat et al. (2020), has found that students who use all three metacognitive strategies the most perform better academically [23]. The same finding is supported by Rodriguez et al. (2016), who found a statistically significant correlation ($r=.235$, $p0.05$) between academic success and metacognitive strategies. Therefore, during foundational training, teachers must foster students' skills by assessing the effectiveness of their learning and correcting any inefficiencies [13].

The findings of this study have significant implications for both educators and students in the context of nursing education. The positive and significant correlation between academic performance and the use of the metacognitive regulation strategy underscores the importance of fostering metacognitive skills among nursing students. Students who effectively employ metacognitive regulation strategies are more likely to achieve better academic results. Therefore, educators should emphasize the development and utilization of these strategies in nursing curricula to enhance students' academic success.

To ensure successful implementation, educators should incorporate metacognitive training as a deliberate part of nursing education. This may involve providing guidance on how to set effective learning goals, develop study plans, monitor comprehension, and self-evaluate progress. Additionally, educators can integrate reflective exercises, self-assessment opportunities, cognitive efficiency workshops, and feedback mechanisms to encourage metacognitive awareness and improvement.

Despite its valuable contributions, this study has certain limitations that need to be acknowledged. Firstly, the research was conducted at a specific institution with a limited sample size, which might limit the generalizability of the findings to other settings or populations. Secondly, the study relied on self-report measures for assessing the use of metacognitive learning strategies, and academic performance of students, which could be influenced by response bias or social desirability. Furthermore, the cross-sectional nature of the study design limits our ability to establish causality or determine how metacognitive strategies evolve over time. Future research with different methodological approaches and larger and more diverse samples could address some of these limitations and provide a more comprehensive understanding of the relationship between metacognitive learning strategies and academic performance. Despite these constraints, the present study provides a valuable foundation for further exploration and underscores the significance of incorporating metacognitive training in educational programs to optimize students' learning outcomes.

CONCLUSIONS

Metacognitive learning strategies have been extensively discussed in the academic literature, offering benefits to both students and teachers. Students can gain insights into their learning behaviors, while teachers can leverage this knowledge to enhance their instructional support.

In this regard, this study addressed the issue of the use of metacognitive learning strategies and its relation to students' academic performance. The study highlighted the high level of use of the three strategies and the existing relationship between the metacognitive strategy of regulation with student success. Indeed, the implementation of educational programs focused on metacognitive learning strategies is considered essential. This research adds value to the field of health care; however, it is desirable that further studies be conducted in order to deepen the research and develop the critical thinking of students as future nurses, through reflection using different metacognitive strategies, with the aim of developing the educational autonomy of future practitioners.

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